Fifty-Ninth Annual Report of the Visitors of the University Observatory for 1933.

Oxford

BOARD OF VISITORS, 1934.

THE VICE-CHANCELLOR (Rev. F. J. Lys, M.A., Provost of Worcester).
THE SENIOR PROCTOR (H. G. Hanbury, B.C.L., M.A., Lincoln).
THE JUNIOR PROCTOR (I. Deane-Jones, M.A., Merton).
THE ASTRONOMER ROYAL (H. Spencer Jones, M.A., F.R.S.).
THE DIRECTOR OF THE CAMBRIDGE OBSERVATORY (Sir A. S. Eddington, Hon. D.Sc., F.R.S.).
THE RADCLIFFE OBSERVER (H. Knox-Shaw, M.A., D.Sc., Trinity).

T. W. CHAUNDY, M.A., Student of Christ Church.	Until Oct., 1935.
G. M. B. DOBSON, M.A., D.Sc., F.R.S., Lincoln, Reader in Meteorology.	
J. S. E. TOWNSEND, M.A., F.R.S., Fellow of New College.	Until Oct., 1940.
F. A. LINDEMANN, M.A., F.R.S., Fellow of Wadham and Student of Christ Church.	

The present report refers to the calendar year 1933.

I. Staff.

The composition of the permanent staff of the Observatory remains the same as in last year's Report. Dr. H. Zanstra of the University of Amsterdam worked at the Observatory as Research Assistant for two months in the Long Vacation.

II. Instruction.

During the Hilary Term the Director lectured on Solar and Stellar Physics, and on Astronomical Spectroscopy in the Michaelmas Term. The number of students averaged five for the first course and fifteen for the second. Dr. Fotheringham offered courses in Ancient Astronomy and Mr. Bellamy on Practical Astronomy which were attended by one and three students respectively. A colloquium on astrophysics was held during the months of July and August, the six meetings of which were well attended. New regulations, modernizing the

schedule of subjects for examination in Astronomy, have been approved by the Board of Faculties, and will come into effect in the Michaelmas Term, 1934.

III. Equipment.

As a result of action taken by the Board of Visitors at its last meeting, a Decree was passed by Congregation on 2 May authorizing the expenditure of £2,400 on the optical parts of a solar telescope and spectroscope. This was a significant step in the development of the Observatory, and represents the first major expenditure on equipment since 1887. Considerable time was spent in planning the most effective equipment which could be procured for this sum, and it was not until July that contracts were signed with Sir Howard Grubb, Parsons & Co., of Newcastle for the mechanical and optical parts of the telescope, and with Adam Hilger, Ltd., of London for the optical parts of the large spectroscope. The work progresses favourably; it is probable that the telescope will be finished by the summer of 1934, and the optical parts of the spectroscope shortly afterwards. A non-technical description of the new equipment appeared in the *Oxford Magazine* for 16 November.

By a Decree of Congregation of 24 January the Observatory was authorized to spend £300 on the mechanical parts of a registering microphotometer. The instrument, designed by R. M. Abraham and the Director, was completed during the summer and put into operation during the Michaelmas Term. Exhaustive tests of its performance have revealed some minor mechanical defects now being corrected by the makers, but the instrument gives every promise of being unique for its high resolving power, for the reproducibility of its photometric readings, and for the accuracy of its mechanical drive.

IV. Work.

Astrophysics. The work on the determination of the surface brightness of the centre of the solar disc was continued during the months of May to September. Some 180 solar spectra

were obtained, and the technique of measuring surface brightnesses differing by as much as 1,800 to 1 fully developed. Another summer's work will be required to complete the observational part of the investigation. In addition work was slowly continued on the temperature of solar granulation.

Dr. G. G. Cillié completed his investigation on planetary nuclei, and was able from his measures of Einstein displacement to show that the nucleus of N.G.C. 6826 was a 'white dwarf' with a surface temperature five times that of the sun, and a mean density exceeding 1,000 gm. per c.cm. After the companion of Sirius the nucleus of this planetary nebula is the densest star yet known. Dr. H. Zanstra worked during the summer on diffuse matter in interstellar space, and on the origin of planetary nebulae. Mr. I. A. Getting of Merton has commenced work on a method of photographing the diffuse clouds of ionized calcium by means of their infra-red radiation. In addition Dr. S. Chandrasekhar of Trinity College, Cambridge, made extensive use of the Observatory during the Michaelmas Term in connexion with a theory of Wolf-Rayet stars which he is at present developing.

Astrographic Catalogue. As the following table shows, the work on the Potsdam zones $+32^\circ$ and $+33^\circ$ continues to be pushed forward at an accelerating rate:

Plates.	*Obtained.*		*Measured.*		*Reduced.*	
	$+32^\circ$	$+33^\circ$	$+32^\circ$	$+33^\circ$	$+32^\circ$	$+33^\circ$
Before 1932 .	61	1	24	0	24	0
In 1932 .	14	3	34	0	34	0
In 1933 .	26	34	32	11	32	11
Total . .	101	38	90	11	90	11

Average number of stars per plate = 532.

This is due to Mr. Bellamy who has continued to take the plates, a task of considerable difficulty since the clock drive of the telescope requires complete renewal, supervise the measures made by Mr. Cooke, and make the reductions. Since 160 plates are needed for each zone it follows that the work is about one third completed.

Reader in Ancient Astronomy. Dr. Fotheringham has continued to volunteer his services to the Observatory as Honorary Assistant. In addition to his work on Ancient Astronomy he has made extensive use of the Hornsby Observations made at the Radcliffe Observatory in the years 1774 to 1798, and recently reduced by Dr. Knox-Shaw, Dr. Jackson, and Mr. Robinson (Oxford University Press, 1932). From these observations Dr. Fotheringham has found evidence of a fluctuation in the motion of the earth's axis, and this he has been able to trace through to modern Greenwich observations of the sun.

Seismology. As a result of meetings of the International Union for Geodesy and Geophysics held at Lisbon in September, which the Director attended as one of the British Delegates, and of the Seismological Committee of the British Association, the financial position of the International Seismological Summary has now been regularized for the next three years. The total annual cost of £880 will be met from the following sources:

University Observatory	£160 (authorized by University Chest)
International Union	£520 (depends upon income of Union)
Seismological Committee of B.A.	£200

In spite of the handicap of serious illnesses Mr. Hughes and Miss Bellamy have maintained almost unimpaired their progress in the preparation of the Summary. The last three quarters of the earthquakes of 1929 were prepared and printed during the year, and the first quarter of 1930 is nearly ready for the press. The work has been unusually heavy, partly because of additional stations which have made the Summary for 1929 the largest on record, and partly because the use of Jeffreys' new Tables of Travel Times has necessitated the development of new methods of reduction. The two Milne-Shaw instruments have been in continuous operation throughout the year, and have recorded over 150 earthquakes.

V. Publications.

The following papers have been published during the year, either as a result of work done at the Observatory, or by members of its staff:

F. A. and E. F. BELLAMY. Volume xi of *Catalogo Astrografico Sezione Vaticana*, 1933.

G. G. CILLIÉ. "The Nuclei of Two Planetary Nebulae", *Monthly Notices R.A.S.*, vol. 94, November, 1933.

J. S. HUGHES and E. F. BELLAMY. *The International Seismological Summary for 1929* (I.W. County Press, 1933).

J. K. FOTHERINGHAM. "Greenwich Personality and the Equinox Correction", *Monthly Notices*, vol. 93, May, 1933.

———— "The Story of Hi and Ho", *Journal B.A.A.*, vol. 43, p. 248, 1933.

H. H. PLASKETT. *The Place of Observation in Astronomy* (Oxford University Press, 1933).

In its reprint form Dr. Cillié's paper will appear as No. 1 in a new series entitled "Communications from the University Observatory", which will be devoted largely to astrophysical investigations.

VI. Miscellaneous.

The Observatory has been fortunate during the year in receiving visits of greater or less length from a number of distinguished astronomers. Among these may be mentioned Dr. A. J. Cannon of Harvard, Dr. G. E. Hale of Pasadena, Prof. H. F. Newall of Cambridge, Dr. C. H. Payne of Harvard, Prof. H. N. Russell of Princeton (The Halley Lecturer for 1933), Prof. F. Schlesinger of Yale, and Dr. V. M. Slipher of Flagstaff.

In addition to the usual astronomical and seismological publications received during the year, Mr. T. F. Higham generously presented the Observatory with a complete photographic record of the damage done at Shillong, Assam, by the severe earthquake of 12 June 1897.

The old part of the observatory building was completely rewired during the year.

H. H. PLASKETT.

UNIVERSITY OBSERVATORY,
OXFORD.
January 11, 1934.